

# Treatment of Time in Lifecycle Analysis

Union of Concerned Scientists

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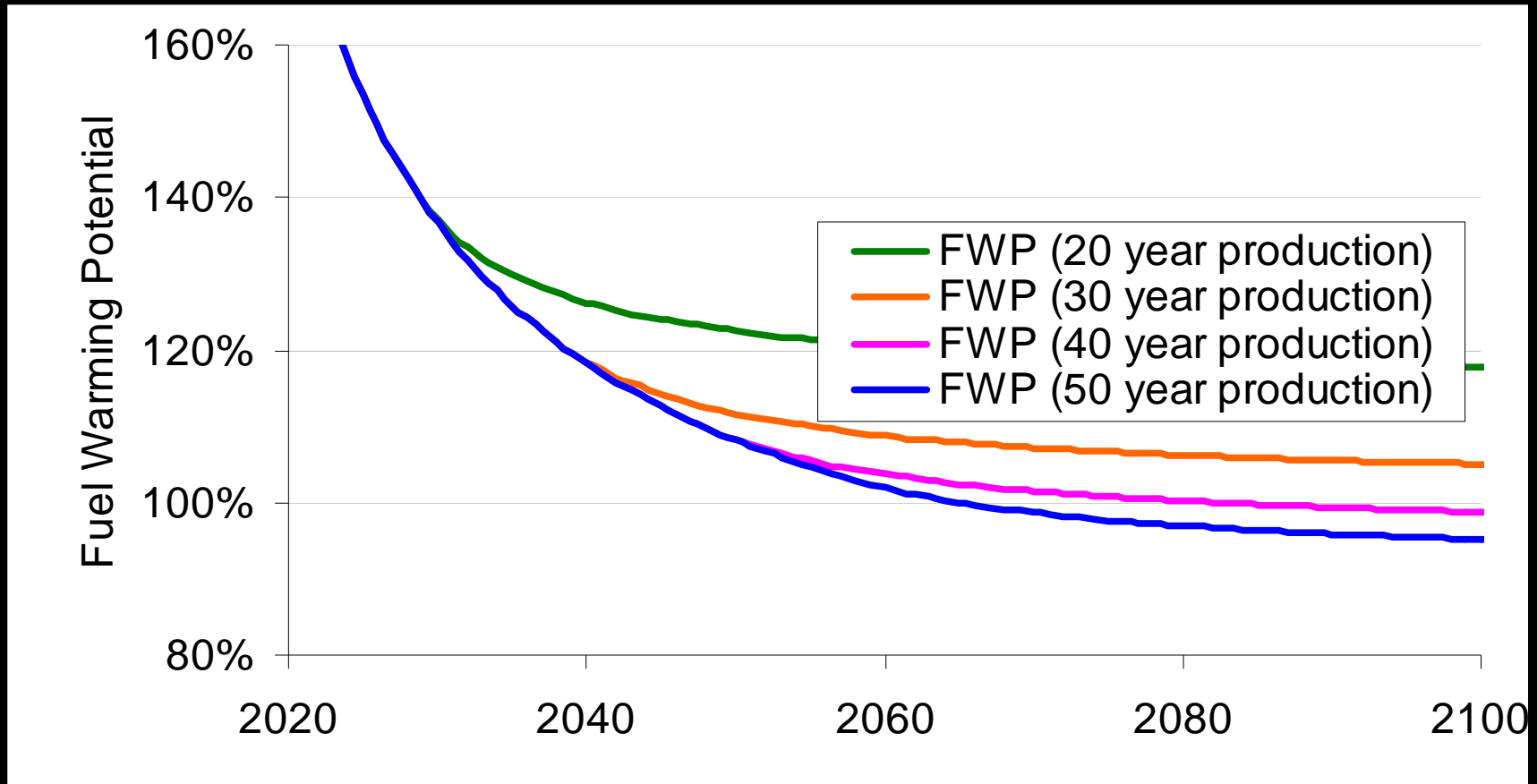
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# Time Principles

- Biofuel emissions
  - Initial spike due to land use change
  - Benefits can accrue over time
- Current CARB LCA amortizes CO<sub>2</sub>EE
  - Consistent with traditional criteria pollutant analysis
  - Does not utilize climate science to estimate impacts
- **Fuel Warming Potential (FWP)**
  - Use climate models (IPCC) to calculate extra abundance of CO<sub>2</sub>EE and radiative forcing
  - FWP is the ratio of the cumulative radiative forcing for the biofuel to the reference fuel over the policy time horizon
- **Fuel Warming Intensity (FWI)** would replace Fuel Carbon Intensity
  - Units of g CO<sub>2</sub>e/MJ
  - $FWI = FWP \times CI(\text{Gasoline})$

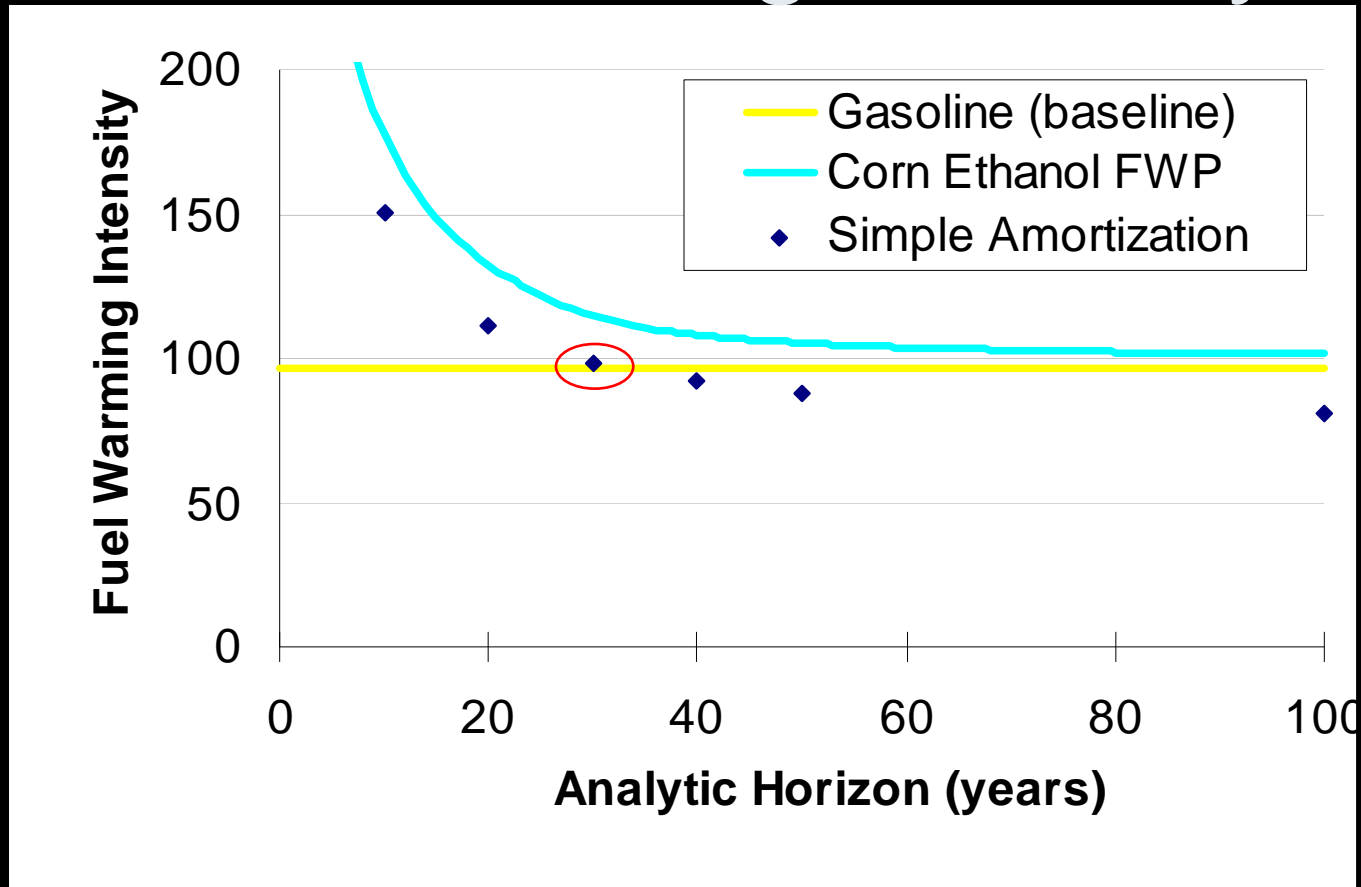
# Fuel Warming Potential



**No net cooling before 2060**

Assumptions: Production starts in 2010, No post production LUC  
Ethanol FWI 898 gCO<sub>2</sub>e LUC + 68.6 gCO<sub>2</sub>e/yr, Gasoline FWI 96.8 gCO<sub>2</sub>e/yr.

# Fuel Warming Intensity



**Simple amortization exaggerates benefits to the climate**

Assumptions: 30 years of production, No post production LUC

Ethanol FWI 898 gCO<sub>2</sub>e LUC + 68.6 gCO<sub>2</sub>e/yr, Gasoline FWI 96.8 gCO<sub>2</sub>e/yr.

# UCS Recommendations

- Use Fuel Warming Intensity instead of Fuel Carbon Intensity
  - Better accounts for climate impact of emissions
- Make reasonable choices regarding time horizons
  - UCS recommends 20-30 years of production and 20-40 years to assess the impact.
  - Factors in favor of shorter term metrics
    - Uncertainty about the length of corn ethanol production
    - Future availability of non gasoline alternatives
    - Risk that reductions in radiative forcing occur too late to prevent irreversible damage from climate change
- Improve performance metrics over time
  - Incorporate costs, benefits and uncertainty